

CLAIMS

## 1. A pneumatic plate element (1)

- having at least one hollow body (3) made from flexible material that is gas-tight and capable of sustaining loads from pressure media,
- also having at least two compression/tension elements (2) surrounding the hollow body (3) for absorbing compression and tensile forces,
- wherein the end of each compression/tension element (2) is connected non-positively with the end of another compression/tension element (2), characterised in that
  - at least one hollow body (3) is located between the compression/tension elements (2) connected by their ends,
  - the compression/tension elements (2) are also connected to each other via at least one pure tensile element (4),
  - and this tensile element (4) may be prestressed via the at least one hollow body (3) that is under pressure loading.

## 2. The pneumatic plate element (1) in accordance with claim 1 characterised in that

the prestressing force in the at least one tensile element (4) is greater than the stabilising force that is required to prevent buckling of the compression/tension element (2) that is loaded with axial pressure.

## 3. The pneumatic plate element (1) in accordance with claim 2,

characterised in that

the compression/tension elements (2) that are always subjected to axial pressure are constructed as purely compression elements (7) and the compression/tension elements (2) that are always subjected to axial tension are constructed as purely tensile elements (8).

4. The pneumatic plate element (1) in accordance with either of claims 2 or 3,  
characterised in that  
the prestressed tension elements 4 pass through the hollow body (3).
5. The pneumatic plate element (1) in accordance with either of claims 2 or 3,  
characterised in that  
it includes prestressed tensile elements (4) that both pass through the hollow body (3) and also pass round the outside thereof.
6. The pneumatic plate element (1) in accordance with either of claims 4 or 5,  
characterised in that  
tensile element (4) passes through the hollow body (3) without non-positive connection between the membrane (9) and the tensile element (4) in the direction of this tensile element (4).
7. The pneumatic plate element (1) in accordance with claim 6,  
characterised in that  
the tensile element (4) is guided through an eyelet (11) incorporated in the membrane (9), wherein this eyelet (11) is sealed in gas-tight manner via a seal (12) lying flush

with the tensile element (4), and wherein this eyelet (11) is axially displaceable on the tensile element (4) together with seal (12).

8. The pneumatic plate element (1) in accordance with any of claims 4 to 6,  
characterised in that  
the tensile elements (4) are guided through gas-tight channels (5) in the hollow body (3).
9. The pneumatic plate element (1) in accordance with claim 8,  
characterised in that  
the channel (5) is formed by two endpieces (13) that are connected to each other by a tube (19) and that can penetrate the hollow body (3) through apertures in the membrane (9), wherein the endpieces (13) can subsequently be attached to the membrane (9) by clamping, bonding or welding, and thus together with the tube (19) form a gas-tight channel (5) through the hollow body (3).
10. The pneumatic plate element (1) in accordance with claim 9,  
characterised in that  
the tube (19) is formed by a hose (14) that is secured in gas-tight manner to the two endpieces (13).
11. The pneumatic plate element (1) in accordance with any of claims 1 to 10,  
characterised in that  
it has at least two hollow bodies (3) arranged essentially parallel in the direction of the compression/tension elements (2).

12. The pneumatic plate element (1) in accordance with any of claims 1 to 10,  
characterised in that  
it has at least two hollow bodies (3) arranged essentially parallel to each other transverse to the direction of the compression/tension elements (2).
13. The pneumatic plate element (1) in accordance with any of claims 1 to 12,  
characterised in that  
the plate element (1) is separable into at least two parts in the direction of the compression/tension elements (2), wherein the partial sections of the compression/tension elements (2) can be connected to each other in detachable, flexurally rigid and non-positive manner via connectors (20).
14. The pneumatic plate element (1) in accordance with any of claims 1 to 13,  
characterised in that  
it has at least two pairs of compression/tension elements (2) that are arranged parallel to each another and are connected to each other at the ends.
15. The pneumatic plate element (1) in accordance with any of claims 1 to 14,  
characterised in that  
it has plate-shaped compression/tension elements (2), the cross sections of which vary over the length thereof.
16. The pneumatic plate element (1) in accordance with any of claims 1 to 15,

characterised in that

cross-members (15) that extend essentially transversely between the compression/tension elements (2) or wind braces (16) that extend essentially diagonally between the compression/tension elements (2) are provided for reinforcement.

17. The pneumatic plate element (1) in accordance with any of claims 1 to 16,  
characterised in that  
at least one compression/tension element (2) tensile element is constructed as a panel with cutouts.

18. The pneumatic plate element (1) in accordance with any of claims 1 to 17,  
characterised in that  
pairs of compression/tension elements (2) connected at to each other at the ends thereof are arranged such that their ends form a polygon.

19. The pneumatic plate element (1) in accordance with any of claims 1 to 18,  
characterised in that  
at least one horizontal intermediate membrane is drawn inside the hollow body (3), which increases the insulating property of the hollow body (3) and reduces the vertical transport of heat by convection.

20. The pneumatic plate element (1) in accordance with any of claims 1 to 19,  
characterised in that  
the compression/tension elements (2) are constructed as two-dimensional, polygonal compression/tension lattices

(23), and these compression/tension lattices (23) in turn consist of several element sections (21) that are joined in non-positive manner by connections (22).

21. The pneumatic plate element (1) in accordance with claim 20,  
characterised in that  
a pair of compression/tension lattices (23) is connected to itself via tensile elements (4) at least at all connections (22).
22. The pneumatic plate element (1) in accordance with either of claims 20 or 21,  
characterised in that  
element sections (21) and the connections (22) are integrated in the membrane (9) of the hollow body (3).
23. The pneumatic plate element (1) in accordance with claim 22,  
characterised in that  
the element sections (21) are made from fibre-reinforced, flexible plastic strips.
24. The pneumatic plate element (1) in accordance with either of claims 22 or 23,  
characterised in that  
the plate element (1) is constructed so that it can be folded or rolled up in one piece together with the membrane of the hollow body (3) and the element sections (21).
25. The pneumatic plate element (1) in accordance with any of claims 20 to 24,  
characterised in that

the element sections (21) that are only subjected to tensile stresses are constructed as purely tensile elements.

26. The pneumatic plate element (1) in accordance with any of claims 1 to 25,  
characterised in that  
the hollow body (3) is divided by gas-tight partition walls into several chambers that may be loaded with pressure independently of one another.
27. The pneumatic plate element (1) in accordance with any of claims 20 to 26,  
characterised in that  
a compression/tension lattice is constructed from different element sections (21) of differing shapes and strengths.
28. A pneumatic support structure consisting of plate elements (1) in accordance with any of claims 1 to 27,  
characterised in that  
several plate elements (1) are joined to form essentially two-dimensional or three-dimensional structures.
29. Use of several pneumatic plate elements (1) in accordance with any of claims 1 to 19 in combination to form larger, connected two-dimensional structures.
30. Use of pneumatic plate elements (1) in accordance with any of claims 1 to 20 as a roof.
31. Use of pneumatic plate elements (1) in accordance with any of claims 1 to 20 as a bridge.

32. Use of pneumatic plate elements (1) in accordance with any of claims 1 to 20 as a floating, rigid container.
33. Use of pneumatic plate elements (1) in accordance with any of claims 1 to 20 in which the at least one hollow body (3) is filled with a liquid and used as a floating, rigid container for transport or storage.
34. Use of pneumatic plate elements (1) in accordance with any of claims 1 to 20 in which the at least one hollow body (3) is loaded with a gas that is lighter than air and used as a floating or semi-floating roof.